

### **Abstract**

An optical reading system is described herein which can be used to detect the presence of a biological substance (e.g., cell, drug, chemical compound) on a surface of a grating-based waveguide sensor. In one embodiment, the reading system includes a light source (e.g., laser, diode) for directing a light beam into the grating-based waveguide sensor and a detector (e.g., spectrometer, CCD imaging device) for receiving a reflected light beam from the grating-based waveguide sensor and analyzing the reflected light beam so as to detect a resonant wavelength/angle which corresponds to a predetermined refractive index that indicates whether a biological substance is located on the surface of the grating-based waveguide sensor. The grating-based waveguide sensor is tuned to have a resonant wavelength/angle at a predetermined spectral location by adjusting a skew angle defined as an angle between a plane of incidence of the light beam directed into the grating-based waveguide sensor and a grating vector which is perpendicular to the lines of a diffraction grating within the grating-based waveguide sensor. In another embodiment, the reading system is capable of performing a multiplexed interrogation of an array of grating-based waveguide sensors.